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THE TRAUMA OF BURNS AND ITS EXPERIMENTAL TREATMENT

S. S. Girgolov (Editor)

/Comment: The following is the complete text of the foreword, appendix and table of contents of a special issue of Novesti Meditsiny, an irregular periodical. This particular issue is devoted exclusively to the trauma caused by burns and its experimental treatment. The foreword, writted by S. S. Girgolov, Active Member of the Academy of Medical Sciences USSR, chief editor (otvetstvennyy redaktor), summarizes most of the articles contained in the periodical./

The articles published in this issue of Novesti Meditsiny /Med News/ are the result of the work of a group of associates of the Academy of Medical Sciences USSR, who worked on problems of the pathology of burns under the guidance of Prof Yu. Yu. Dzhanelidze, Active Member of the Academy of Medical Sciences USSR. After his death, the work was continued under the supervision of S. S. Girgolov. Over 20 original research projects were carried out. Topically related research has been grouped into individual articles. A list of the laboratory procedures used in each case is presented in the appendix.

Although the greater part of the material presented is purely experimental, its practical applicability makes it of value to physicians. Without "prescribing" the actual treatment of burn trauma (such conclusions would be beyond the competence of pathophysiologists), we merely indicated the direction in which work should be carried out in order that new methods of treatment be based on the experimental data obtained.

A summary of the articles follows:

1. In the light of the modern concept of the nervous system as a determining factor in the development of physiological and pathological processes in higher animal and man, certain doubts have arisen as to whether the definition of the syndrome of shock may, as in the past, be contradistinguished from the definition of the syndrome of collapse. A considerable amount of recently compiled data

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testifies in favor of a close connection between collapse and the so-called torpid form of shock. Special experimental differentiation (or identification) of these processes was begun only recently, and has aroused an increasing amount of interest. It is for this reason that this symposium begins with a review of pertinent questions (i.e., an article by G. L. Frenkel', Yu. B. Beringer, and A. S. Vol'pe: "The Concepts of 'Shock' and 'Collapse'").

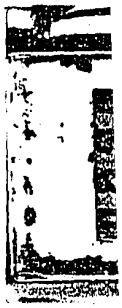
2. A wide controversy has existed up to now, with regard to the tactics and technics of thermal treatment of the traumatized organism, particularly in cases of burns: some authors have suggested intense heating, and others have defended methods employing a general cooling. A. S. Vol'pe, in his article "Application of Heat in a State of Shock," offers an experimental solution for this question, and substantiates the use of heat in moderation. In his statement he emphasizes that the amount of heat normal to a healthy organism may be excessive in a state of shock.

3. Our knowledge of the amount of blood plasma lost in a state of shock caused by burns is based on the phenomenon of hemoconcentration, and its quantitative expression. This extrapolation is widely accepted. The specific approach explains the interest in all the details of the hemoconcentration symptoms in burn cases: their reliability (possible pseudohemocentration), aniotopography, possible quantitative connection with the extent of the burn, etc. The article by I. D. Zhitnyuk, "Plasma Loss Due to Burns, and Measures to Counteract It", compiled on the basis of numerous experiments, will give proper orientation to the physician.

4. Many facts lead us to assume that the reactivity of an organism affected with burns is modified. This reactivity cannot remain unchanged, since in a state of shock, deep-seated shifts take place in the nervous activity, and the considerable dissociation of proteins in extensive burns makes autosensitization of the organism possible. Naturally, the question arises as to the advisability of administering any therapeutic agents to the subject parenterally, especially if this means introducing protein derivatives, or substances with hypotensive action. The article by G. F. Koveshnikova, entitled "The Reactivity of a Burn-Affected Organism," demonstrates the reactions of such a burned-injured organism towards the introduction of species-nonspecific serum (the newest blood substitute), and of campolon (a /liver/ preparation protecting the liver from barbiturates in the sleep therapy of burns), and shows the safety of both measures, even under aggravated experimental conditions. This widens the scope for the use of species-nonspecific serum, and of the indication for the use of sleep therapy in cases of burns.

5. In determining the quantity of plasma for an emergency transfusion, it is considered advisable to base computations on the extent of the burned area (in percent) in relation to the total surface of the body. The precision methods and apparatus required vary with actual clinical conditions. An article by G. L. Frenkel', V. A. Tikhomirov, and Ye. A. Fedorov, entitled "On The Method of Computing the Relative Size of a Burned Area of the Human Body," thoroughly analyzes this question and offers the practicing physician methods of determining the percentage of burned body surface with more or less precision, depending on the conditions and requirements of the case.

6. The use of Pavlov's protective inhibition in combating various pathological processes comprises an era in the history of medicine. However, the practical application of this method in the treatment of shock caused by burns is only beginning. I. D. Zhitnyuk indicates in his article that any substance used for the purpose of replacing lost plasma is considerably less effective than sleep therapy, which literally "paralyzes" /puts an abrupt stop to/ the loss of plasma (judging by the hemoconcentration). Sleep therapy has been found to have the best over-all action when protective inhibition is brought into effect in the early stages of the pathological condition (cf. G. F. Koveshnikova. "The Significance of the Time Element in Sleep Therapy, With Respect to the Effectiveness of the Latter in Experimental Burn Shock").



7. A. R. Grushkin, in his article "Use of the Floating Drop Method in Speedy Clinical Diagnosis of Plasma Loss in Burns," suggests for the first time a method by which Soviet physicians may determine at once the amount of plasma lost, without using complicated apparatus, and repeatedly check any changes in this amount.

8. Controversial statements have appeared in recent surgical literature, both commenting on the difficulty of detecting the erectile stage of shock, and observing that a delay in identifying this stage means a delay in applying anti-shock measures. G. L. Frenkel' and G. F. Koveshnikova, in the article "The Erectile Stage of Burn Shock," indicate that under experimental conditions this stage invariably occurs. In their article entitled "Early Observations of Hemodynamic, Biochemical, and Hematological Modifications in Burn Patients," A. S. Vol'pe and G. F. Milyushkevich confirm this statement with first-hand observations of the early stages of this process recorded in the emergency ward of a large, specialized institution.

9. The danger of using tannin in the treatment of burns affecting the liver is a matter of common knowledge. This method involves the possibility of causing severe injuries to the liver. Rejection of the Nikol'skiy-Bettmann method in the surgical treatment of an adult does not detract from the above dangers, since tannin remains the favorite method for treating burns of children. In spite of this, A. S. Sarkisov, in his article "The Toxic Properties of Tannic Acid in the Treatment of the Liver and Kidneys in Severe Burn Trauma," concludes that actually the toxic effects of tannic acid on the liver and kidneys do not contraindicate its use in the treatment of burns.

10. Almost all the research work on the questions of shock and numerous other processes involving hemodynamic states was conducted on animals with a normal circulatory system. Also, the deliberately aggravated conditions frequently utilized in experimental pathology may sometimes evoke certain phenomena which would not appear without artificial aggravation, but are latent and, when they unexpectedly appear, may aggravate the course of the process. G. L. Frenkel' and I. B. Izmaylova, in their article "A Method of Obtaining A Chronic Circulatory Overload," describe in detail their method of producing a chronic circulatory overload by means of several procedures which reduce operative failures to a minimum.

11. The problem of toxemia and the general role of the humoral factor in the pathology of burns is very confused. Solution of this problem should begin with study of the dynamics of absorption from the burned area. I. P. Petrov and his associates already have done some of this work. Ye. A. Pchelina, in her article "Absorption From the Site of a Burn," fully agrees with the results of the work of Petrov and his associates, and indicates that the role of the humoral factor, especially in the genesis of an early toxemia caused by burns, is clearly overrated; and that a practicing physician should not concentrate his attention on the problem of early absorption of pathogenic products from the seat of the affection.

All the research described above was conducted at the Leningrad Scientific Research Institute for First Aid. In conducting the research, the permanent personnel of the academic group was joined not only by staff workers of the institute, but also by certain nonresident students. Thus, there was a group of 15 persons, the results of whose work is presented in these treatises.

Yu. Yu. Dzhanelidze entrusted Prof. Yu. M. Gefter, Chief of the Laboratory of Biochemistry of the Institute, and Prof. G. L. Frenkel', Chief of the Laboratory of Pathophysiology, with practical supervision and methodological direction of the work. Dzhanelidze retained ideological direction of the whole large complex of experimental research. This order was preserved by S. S. Girgolov after his death.

The work described in articles 5 and 17 was done on the basis of the Laboratory of Biochemistry, and the work described in the remaining articles was done on the basis of the Laboratory of Pathophysiology.

APPENDIX

The material in this periodical has been presented in outline form to eliminate details which would not be of great importance to nonspecialists, and to present the material so that it will be readily available to clinicians. The index below explains the laboratory procedures followed in each case.

Article 1. Experiments were conducted on 20 cats. A record was made of blood pressure under the action of synanthrin. The work was conducted during spinal anesthesia of the animals through application of ether narcosis.

Article 2. Experiments were conducted on 70 rabbits. A record was made of blood pressure. Burns and electric trauma were induced against a background of the action of curare, adrenalin, and novocain.

Article 3. Experiments were conducted on 140 rabbits. Gas metabolism was determined by the closed method in a Shaternikov chamber, and muscular tissue respiration by the Warburg method.

Article 4. Experiments were conducted on 68 rabbits. As a contrast medium [in roentgenographic measurements of the reactions of lymph vessels], 0.75 cm^3 of a 50% collargol solution was used. The solution was injected into the soft tissues of the sole (cushions of the paws) at various intervals following the burn. The opposite extremity served as a control standard.

Article 5. Two hundred and seventy blood examinations were performed on 66 burn cases. The protein coefficient was determined by the nephelometric method. Protein content was determined by Kjeldahl method.

Article 6. Experiments were conducted on 210 rabbits and 30 cats. The animals were subjected to various degrees of heat by enclosure in a heat chamber, and by exposure to ultrahigh-frequency waves.

Article 7. Experiments were conducted on 112 cats. Urethane narcosis was produced at various intervals after affliction with burns, by injecting subcutaneously 2 ml of a 50% solution of urethane per kg of weight of the animal.

Article 8. Experiments were conducted on 200 rabbits and 30 cats. The development of burn-produced hemoconcentration, and the effects of cold and narcosis on hemoconcentration were studied.

Article 9. Experiments were conducted on 148 rabbits. The rabbits were subjected to injections of species-nonspecific serum in a normal state and after a burn; under narcosis and in an unnarcotized state; and were treated with barbiturates and campolon against a background of burn trauma.

Article 10. Experiments were conducted on 30 rabbits. Transfusions of blood and blood plasma were performed.

Article 11. Experiments were conducted on 300 mice. Their livers and kidneys were subjected to histological examination.

Article 12. Data on 5,000 measurements of weight and height of human beings of both sexes were utilized for computing average measurements.

Article 13. Experiments were conducted on 80 rabbits. Total body surface of the animals were experimentally determined.

Article 14. Experiments were conducted on 200 rabbits, 30 cats, and 8 dogs. The floating drop method was used in determinations of the hematocrite value and of the hemoglobin and protein content.

Article 15. Experiments were conducted on 30 dogs. Aortic deficiency in the dogs was experimentally induced.

Article 16. Observations were made on 30 burn cases admitted to an emergency ward. Arterial and venous blood pressure were recorded; blood was tested by the floating drop method and was also tested for biochemical indicators (proteins, residual nitrogen, sugar, ascorbic acid, and chlorides).

Article 17. Research was conducted on 390 burn patients. Sugar, lactic acid, and organic acid content was determined.

TABLE OF CONTENTS

- E N D -